

# CIRCUMVENTING THE MAHSEER AND OTHER SPORTING FISH IN INDIA AND BURMA.

BY

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(With 1 plate and 2 text-figures).

## PART I.

### INTRODUCTION.

It is chiefly because I have been pressed by friends, both through the press and directly, and that the last book published on Indian fishing is eighteen years old (*The Mighty Mahseer* by Skene Dhu) that I am attempting to write this account. A series of articles on the 'Game Fishes of India' by Dr. S. L. Hora is being published in this *Journal*. It is written mainly from the scientific aspect and is directed to provide accurate information about the status and distribution of Indian Game Fishes. If one is to write about 'Mahseer', one should in the first instance know what species of fish one is writing about. At present we do not know how many different species of fish are included under the name 'Mahseer'. Dr. Hora's work is directed to unravel these and other problems. The present work deals with the subject, purely from the fisherman's point of view. It has been my intention to write chiefly for the young angler, and for those with less experience than my own, and to provide all the information required without having to purchase for a start the other books published on fishing in India.

For this reason I have included much that would appear unnecessary to the possessor of the *Rod in India*, or other works. I have tried, further, to include here information which has not been dealt with previously, but which will be of interest to anglers in general.

I have refrained from giving long narratives of fights with fish, or large bags made; these are beside my object. I wish to see ten rods fish in the place of one, and to encourage the study of the mahseer.

I will ask the reader to bear in mind these aims. What I have written is written by an angler for the angler. I offer little to the experienced, merely the point of view of the individual. My aim is to help some to catch more fish than they already have done, and to others to start at the beginning. This work does not presume to have any literary value, or any interest outside the subject to which it is devoted. It is an endeavour to impart knowledge of the subject, to those prepared to accept my simple expression based on experience, of the best ways to master the many aspects of angling in India and Burma.

I offer my advice for what it is worth, so that it may be a guide and help in starting you off on an angling career to obtain sport as good as any in the world; for a fish that takes two to

three minutes per pound to kill, on fly rod and light tackle, cannot be despised by any angler. I refer of course to the mahseer, to which this book is chiefly devoted.

Eighteen years is a long period of time to cover. From the angler's point of view, much of the water that was good has been spoilt either by canal systems or development; but there is still plenty of scope for the keen angler, and sport is as good. I have perhaps neither the qualifications nor the experience of many others in the country today, but I have waited 18 long years for a lead and to all of you whose experience outweighs my own, this is my answer!

Nine years ago I was approached, as I have already said, to write a book on fishing; after much correspondence and trouble I got it compiled. I derived a great deal of pleasure in doing so, but the publishers fought shy, as the expense of publication would not, in their opinion, be covered by the demand for such a book in India and Burma. It was full of maps, sketches, and photographs, but not any more than a book by a plant hunter or big game writer. Why big game in India can stand so much publication (almost a book or two a year), and fishing not one in 18 years I fail to understand. Especially as there is almost a boring repetition of facts appearing in recently written shikar books; nor can it be that for every man keen on big game less than one in eighteen is an angler! However, the fact remains that the book was not published. Now, to meet the still pressing demand, I have cut down maps, sketches and photographs to a minimum; and to keep within the limits of publication, and publishers fears, I have condensed the original book into 250 pages of twelve chapters.

The chapter on practical Natural History, which is in a strict sense not about natural history as the 'giants' know it, but a simple and straightforward way of studying fish for purposes of identification, should not deter the reader who need have no fears of being bored by long lists of Latin names and technical definitions. There is nothing in this chapter with which a good angler should not be familiar.

I am indebted to Dr. Sunder Lal Hora, Director of Fisheries, Bengal, and Dr. T. J. Job for kindly going through and rearranging the chapter, and to Dr. Hora's artist for the excellent labelled drawings of the Putitor Mahseer.

I have also dealt with the scientific aspects of angling not hitherto touched on by any of the writers on Indian fishing; in fact there is much in contradiction to their interpretation of the senses of fish, and their reaction to artificial lures. In order to elucidate the practical interpretation of the senses of a fish it has in the first place been necessary to quote freely from the world authority, Norman, and others, so as to acquaint the reader with facts about fishes not generally understood, and which do not ordinarily come his way. The practical application of the senses as applied to angling are of course my own, based on individual experience. Only a practical test will convince the angler whether my interpretation is right or wrong.

Hints to the Novice on the subject of tackle, with aids to its selection from confusing price lists and catalogues; a few general

remarks on casting with fly and spinning rod; the points to remember while playing a fish; where to look for fish; with a few suggestions on kit and the conditions likely to be met with on a fishing trip have been included. Most of these are dealt with again, and in more detail.

The subject of 'Tackle for Mahseer' has been subdivided for purposes of convenience into heavy, light, and medium fishing. More detail has been given in dealing with the selection of tackle, the tying of traces, knots, mounting spoons, etc.; and there is a list of a few tackle dealers in India.

'Fishing for Mahseer', covers a fairly wide field, embodying all the many aspects and considerations likely to influence the angler and fish; with a sketch map of a stretch of river, 'lettered' to assist in recognising good water. Most of the chapter is devoted to spinning for mahseer; but gram, paste, and dead bait fishing are also discussed. I propose to include a short account dealing with the 'Other Sporting Fish' and how to circumvent them. It has plates of most of the commoner fish likely to be taken. I have devoted some attention to Burma, giving full page illustrations of six forms of mahseer I caught, with details of the colouring, which should be found interesting; also full notes of bags and sizes of fish taken around Myitkyina. The account of fishing in Assam, is a reproduction of letters and notes kindly sent me by the many sportsmen and anglers with whom I got in touch, through the curators of the Bombay and Darjeeling Natural History Societies. The plates of the teeth of mahseer and carp, are most interesting and instructive.

'Tank angling', is dealt with briefly, and has two valuable notes on Cutla fishing.

'Sea and estuary Fishing', gives sufficient reference to guide those interested to good sport.

In 'Scraps from my Note Book', will be found general information necessary and useful to all fishermen.

If this series of articles justifies my conviction that there are more anglers in India than publishers imagine, a full and up-to-date book might follow.

I think, myself, that this is an unsuitable time to publish a book, but it has compensations for those of us who have had 'cold water' thrown on all our efforts to join the Forces, and to the many civilians and soldiers whose lot it is to stick it out in administrative posts which have to be held in times such as these.

In conclusion, I take the opportunity of thanking all those anglers, who nine years ago so readily responded to my requests for notes, and went to the trouble of making maps and sending photographs. I hope that at no great distant date these will prove useful in a book on Localities.

To the tackle dealers I tender my apologies should I have unduly criticised goods; it is with no intention of disparagement but solely to illustrate my point, and to improve tackle generally.

To the critic! This is a beginning; yours is the last word! The substance of these articles is based on good bags and results; if you can offer better, I shall be the more pleased.

## I. MAHSEER FISHING AS COMPARED TO OTHER SPORT.

Children angle for minnows with bent pin and cotton thread, big game sea fish are captured by their parents with specially devised rods and appliances. Each in its own way provides the sport that is sought.

As I am dealing with mahseer chiefly, and other fishing generally, it will suffice for the present to write a few words as to what mahseer fishing really means.

The mahseer is essentially a fish of the rocks, the rapids, and the hills. In his quest for this fine fish the angler is taken into wild surroundings amidst some of the finest of nature's scenery. It may be that he will find his sport in the Himalayas, where is the grandest scenery in the world, and where the turbulent river winds its way through dark gorges clad in fir groves and rhododendrons, with perhaps a glimpse at the head of the valley of the Eternal Snows—the stainless ramps of huge Himāla's wall', where the snow-fed torrent has its sources; or perhaps he will be wielding his trout rod amid the charming scenery of the valleys of Kulu or Kashmir.

The scene, again, may be along the banks of rivers in Garhwal or Kumaon, where the deep gorges are most oppressively hot, or in the lakes of Kumaon in a lovely climate. Then perhaps his efforts may lie in southern India, the yet secure home of elephant and bison, where unknown and almost impenetrable forests rise like a wall from the banks of the stream, and in which even people of the aboriginal tribes can become lost amid the tangle of mountains and vegetation; or it may be that he is wandering along the many streams of the Western Ghats, in enjoyment of the marvellous scenery peculiar to the favoured climate of Mysore.

A few days in a ship or train, and the fisherman can be in Burma or Assam, in pursuit of that monster mahseer of his dreams, which he will perchance find at the 'Confluence', or in one of the tributaries of the mighty Brahmaputra. In those lands the waters beloved of the noble mahseer are fringed by giant bamboos waving their graceful fronds over the placid depths, or by splendid trees whose immense serpentine roots are washed by the roaring rapids. There will be the dense retreats of the wild elephant, the secure cover for bison and other game, the last barrier put up by long-suffering nature against the ever destroying hand of man.

In the upper story of forest trees, growing straight and tall, their branches wrapped in mosses and orchids and fringed with ferns, the gibbons sport and play. Often will their far-sounding cries be heard, but seldom will the animals be seen; so with the birds which call and twitter in the jungle thickets, and so with the peacock, pheasant, jungle fowl and all the life in those teeming evergreen forests. In the few open spaces and at the crossings of the streams, will be those swarms of fluttering butterflies of gorgeous hues which congregate at such places; and strange little flowers peep timidly from amongst the vegetation which smothers all the land.

Shooting, fishing, painting, photography, are all in abundance for those who will venture into the wild places where pursuit of the mahseer will lure them. The thrill of a big mahseer, hooked in heavy water, hurling himself down the rapid with express speed to the tune of a fast emptying reel, has an electric joy apart from any other sport. There is nothing quite like it; and once experienced it is imprinted for ever on the tablets of memory. Many a sportsman has truly said that he would rather catch a big mahseer than shoot a tiger.

I have been fortunate in enjoying many of the varied kinds of sport obtainable in India; and, were I given to comparison, would place mahseer fishing second only to pig-sticking. The days available to the votary of the spear are all too short, for, with the passing of the years age must give way to youth; but at least we can fish while health and eyesight last.

It is not perhaps fair to make comparisons. The whirr of a rising partridge, the swoop of a flying duck, the call of the Koklas pheasant, or the gorgeous Monal as he hurtles through the pines; the mad gallop with the bobbery pack in pursuit of fox or jackal, the yet more reckless pursuit of the great grey boar; is each in its own place akin to that heart-beat when the driven tiger approaches the waiting sportsman, with that moment when at last one closes into action with the elephant or bison tracked since dawn. At all such times one is spellbound by the intense enjoyment of the moment; but the instant of contact with a heavy mahseer, he of the two or three score pounds, in the racing rapids of a river, is a thrill unsurpassed in any other sport.

The varied joys and excitements of a fishing trip in wild places are a panacea for all worldly cares and troubles. The quest of the mahseer will take the young soldier, or civilian, or those many others who are entering into various walks of life in the East, among wild places and peoples where will be gained that self reliance and poise of character which is the outcome of responsibility. In close contact of the many varied people of the land will much knowledge be gained which can be acquired in no other way.

Fishing is a sport which can meet many tastes and pursuits. The painter, the hunter of big game, the entomologist, the botanist, the ethnologist, in fact all the ologists will find interest and refreshment apart from the actual fishing; there, also, will be found that solitude in communion with Nature which is the Mecca of all lovers of wild life.

It is to Burma in particular that my love is given. The wild scenery, the giant trees, the multi-coloured orchids, the birds and butterflies of brilliant hues, and above all the pleasing and cheerful people—the Burmese and Shans, the Chins and Kachins, attract me in a way apart from the fascinations of other countries in the East.

Have I dwelt too long upon the joys and attractions in the quest of the mahseer? In what better way can a holiday be spent than in pursuit of the elusive *Barbus tor*? It has been my endeavour in the following chapters to provide the answer.

## II. SIMPLE NATURAL HISTORY OF THE MAHSEER.

In this chapter I am merely endeavouring to put before the angler certain facts that will come within his ken, and aid the making of notes by which he can do much service to Ichthyology and a greatly neglected subject, the study of one of the most sporting fishes in the world, the Mahseer of India and the East. The immortal Thomas in 1873, 1881 and again in 1897, published the classic 'Rod in India', and other lesser books have followed in its wake. They, however, have been written almost solely with the object of showing the way to sport rather than of combining with fishing the study of the fish that provides that sport.

This much have I aimed at: To show in simple form how to recognize the many varieties of the fish that has afforded such grand sport ever since the British came to India, and of which we still know comparatively very little; and to make notes of interesting points, which often catch the eye of the Angler, but which, alas, seldom receive the attention and publicity which they deserve.

*The Angler's part in Natural History.*—The Angler can be the best friend of Ichthyologist. Simple notes such as are suggested in this chapter will enable the 'Pundits' to arrive at scientific results; we anglers can be their field naturalists. Observations made intelligently and with that enthusiasm in the subject I am asking fishermen to attain, will be of the greatest value, and most gratefully appreciated by the staff of the Bombay Natural History Society. It takes but a matter of five or ten minutes to note down the necessary details as to any unusual fish (data required will be found later on), and the preservation of a specimen in formalin is most simple. So to all anglers reading what I have written I make an appeal for help in elucidating all that has to be learnt about the Mahseer. Some may say, 'What does it matter whether a fish is a Black, Red or a Green Mahseer? I am out only for the sport, and so long as I get that, I am satisfied'. The answer to that is that to fish for sport only, without a thought to the aid of Science in learning all that there is to know of the fish, becomes mere body-snatching; no true sportsman, once enlightened in the matter, can for long retain that attitude of mind; and should these articles of mine make even a few converts, and result in but a few specimens and notes being sent in to the Society, I would feel it sufficient reward for my labours.

A good deal of what follows I owe to the works of the late H. S. Thomas (1897), of Sir Reginald Spence and Mr. S. H. Prater (1932), of Professor Neilson (1934), of Mr. J. R. Norman (1931) and of Dr. S. L. Hora (1939—).

Most of the fishes of any importance to the angler belong to two families—the Cyprinidae or Carps, and the Siluridae or Catfishes. The Mahseer belongs to the Carp family. But he is very different in size, flavour, strength, activity, and so forth, to his ignoble namesake in England. Hence you had better call him a Barbel. The status of the Mahseer is very much disputed. A number of species seem to inhabit the waters of the Indian Empire. Thomas (p. 27) writes, 'Further experience has confirmed me in

the view advanced in 1873, that there are more Mahseers than have been named, and that if it were possible that as much accurate attention could be given to the Mahseer as has been devoted to the Salmonidae of Great Britain, of Europe, and of America, it would be found that the Mahseers of India would likewise grow in numbers'.

Thomas's prophesy has come true, for, in his recent series of articles on the 'Game Fishes of India', Hora has shown that at least 4 to 5 kinds of Large-scaled Barbels are found in the Himalayan waters.

#### *Popular names.*

Mahseer are known by numerous vernacular appellations in different parts of India and Ceylon, such as *Putitor* (Goalpara); *Tor* (Rangpur); *Sāhārā* and *Tūriyā* (Purneah); *Māsāl* (Kosi R.); *Kajrā* (Dāūdānagar, Sone R.); *Burāpatra*, *Junga Peetia* (Assam); *Naharam* (Hindi); *Kukhiāh* (Punjab); *Kurreah* (Sind); *Kendi*, *Bōmin* (Tamil); *Peruval*, *Harale-minu* (Canarese); *Hāllāminu* (Mysore Canarese); *Meruval* (Malayalam); *Heragālu*, *Peruval* (Tulu); *Kadchi*, *Barsa Masla* (Marathi); *Kuriāh*, *Lela* (Sinhalese). Fishes throughout the world appear to have more local names given to them than any other animal. Various opinions have been expressed about the etymology of Mahseer. Lacy and Cretin (1905, p. 2) observe, 'The derivation of Mahseer from *maha sir*—big head—may be merely an attempt to give a meaning to the word. The derivation from *maha sher*—big tiger—is fanciful, although the natives sometimes pronounce the word 'Mahseer'; it is merely the soft equivalent of the word. A third and a good derivation is from *Massulāh*, *Mahasalka*—big-scaled. The natives often call the fish *Mahsol*. The Mahseer has got bigger scales than any other fresh-water fish in India. Its big scales form one of its most distinctive characters. A big Mahseer has got scales as big as the palm of one's hand, which make the use of the gaff unsafe. The scales are used as playing cards in some parts of India. A fourth, and a likely, derivation is from *Matsya*, which is the Sanskrit word for 'fish', and is used in the Vedas. As the Mahseer is a sacred fish, preserved near many Hindu temples, it is probable that the Brahmans called it 'Fish' *par excellence*, pronouncing the word 'Mahsia'. More recently Hora has dealt with this point exhaustively and is of the opinion that Mahseer is very likely a colloquial form of *Mahāśīrasha* or *Mahāśīras*, the bigness referring to the front part of the fish and not merely to its head or snout.

I propose to describe below how fishes are identified and to give the general features of the Golden or the Common Himalayan or the Putitor Mahseer, *Barbus* (*Tor*) *putitora* (Hamilton); pointing out the peculiarities of the other species so far recorded from North Indian and Burmese waters with their geographical distribution.

As with other classes of the Animal Kingdom, Fishes are divided into various sub-classes, orders, sub-orders, families, sub-families, genera, sub-genera and species, the classification being based on resemblances or differences in structure. The cartilaginous fishes, such as sharks, skates and rays, differ so obviously and fundamentally from the bony fishes, that the former are grouped together

in a separate sub-class. But in spite of certain structural resemblances they differ among themselves in certain characters so that this sub-class is sub-divided into an order to include all the sharks, and another to include all the skates and rays. The family is a group of fishes within an order or sub-order, possessing certain general features in common. Different members of a family, in accordance with particular affinities, are grouped into separate genera. The members of a genus or even of a sub-genus are themselves distinguished from one another by specific differences, usually indicated in the nature of the teeth and fins, in the number and arrangement of the scales, and other anatomical details. Thus we come ultimately to the species. It has to be remembered that even among the members of a species no two individuals are ever perfectly alike, and minor individual variations are bound to be met with. These, however, are hardly of any specific significance. In scientific nomenclature a fish gets a double name, the first word representing the genus, and the second the species. The name of the author who first described the species usually follows. In certain cases another name is included between the generic and the specific name to signify a sub-genus. Thus the common Himalayan Mahseer is scientifically known as *Barbus* (*Tor*) *putitora* (Hamilton), where *Barbus* is the generic name, (*Tor*) is the name of the sub-genus, *putitora* is the specific name, and the fish was first described by Francis Hamilton. From the foregoing account it will be seen that the classification and identification of fishes is based on resemblances or differences in their anatomy. An attempt is made here to explain with special reference to the Mahseers the main external characters on which the differences are based, and some of the terms and abbreviations commonly used in scientific descriptions of fishes.

*Form of body.*—Fishes are usually boat-shaped, being longer than broad or deep, and adapted for swift movement in water. Variations from this typical form, however, are not rare. The body of a Carp is said to be compressed, *i.e.*, flattened from side to side, while that of a Catfish is said to be depressed, *i.e.*, flattened verti-

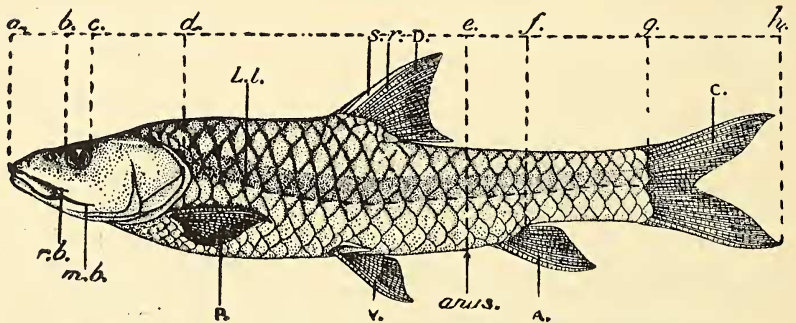


Fig. 1.—The Putitor Mahseer, *Barbus* [*Tor*] *putitora* (Hamilton).

(For explanation see page 188).

cally. The Putitor Mahseer (fig. 1) is an oblong, somewhat compressed, streamlined, trout-like fish in which both the profiles are gently and gracefully arched. The head is broadly pointed anteriorly

and behind the anal fin the tail becomes considerably narrow. The gape of the mouth does not extend to below the eyes; it is horizontal with the opening obliquely directed upwards.

The lips are fleshy and continuous at the angles of the mouth; the lower lip (Fig. 2 *b*) is produced into a median lobe and the post-

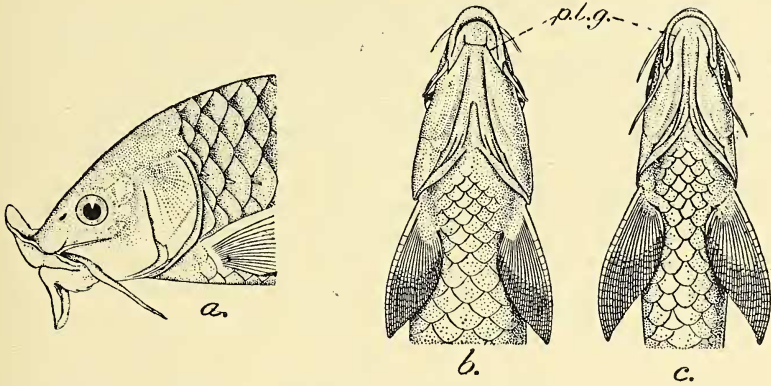


Fig. 2.—Oral features of Mahseers.

(For explanation see page 188).

labial groove (*p. l. g.*) is continuous. The condition of the lips varies greatly in individuals of different sizes and in those collected from different localities. It is highly desirable that anglers may kindly note the condition of the lips of the Mahseers caught by them and also make a detailed note of the length.

**Body proportions.**—Fishes, as a rule, continue to grow as long as they live, and hence the actual length of a specimen is of very little significance in its identification. But the relative lengths of the different parts of a fish remain constant. The body proportions may vary in young specimens, and therefore the measurements of fairly adult specimens are reckoned. The *total length* of a fish (fig. 1 *ah*) is measured from the tip of the snout to the end of the tail fin. The *length of body* or *standard length* (*ag*) is the distance from the tip of the snout to the origin of the tail fin. The *length of head* (*ad*) is the length from the tip of the snout to the hind margin of the bony part of the gill cover. The *depth* is the vertical distance between the dorsal and ventral surfaces at the deepest part. The *diameter of the eye* (*bc*), the interorbital distance; length of snout (*ab*), i.e., the portion of the head in front of the eye; the *length of caudal peduncle* (*fg*), i.e., the distance between the last ray of the anal fin and the origin of the tail fin; the *least height of caudal peduncle*, etc. are also measured. The girth of the fish is the measure round the stoutest part. The tail (*eg*) in the scientific sense is the portion of the body behind the anus, though in the popular sense the tail may include the tail fin also.

In a scientific description of *B. (Tor) putitora*, one reads as follows:—The length of head is contained from 3 to 3.6 times in the standard length. Depth of body is contained from 1.1 to 1.4 times in the length of head. The diameter of the eye is contained

from 2.8 to 5.3 times in the length of head, from 0.8 to 1.7 times in the length of snout, and from 0.7 to 1.4 times in the interorbital distance. The least height of the caudal peduncle is contained from 1.4 to 1.8 times in its length.

*Fins.*—According to the position the fins of fishes come under two categories: the paired fins and the vertical fins. The paired fins consist of a pair in the fore part of the body, one on each side, called the pectorals (P) and a second pair below the pectorals, on the lower surface of the fish, called the ventrals (V) or pelvics. In some fishes either or both of these may be absent. The fish uses the paired fins mainly for balancing itself in water. The vertical fins are the dorsal (D) on the middle line of the back, the caudal (C) or tail fin and the anal (A) in the middle line of the belly. The tail and its fin constitute the chief swimming organ of the fish. The bony rays which support a fin may be either simple or branched and articulated (composed of numerous branched joints which render the fin flexible). Simple rays are called spines (s), while the others are described as soft rays (r). Some spines may be soft and flexible, but they are distinguishable from true soft rays by their plain unbranched nature.

Thus the fin formula of the specimen of the Himalayan Mahseer figured here as:—D. 4/9; A. 8; P. 17-18; V. 10; C. 19 indicates that the dorsal fin has 13 rays of which 4 are spines and 9 soft rays; the anal has eight rays; the pectoral has 17 to 18 rays; the ventral has 10 rays; and the caudal has 19 rays, all soft. In the Himalayan Mahseer 'the commencement of the dorsal fin is opposite to that of the pelvics, and is almost midway between the tip of the snout and the base of the caudal fin. The last spine is very strong and bony; it is generally shorter than the depth of the body below it, but in some individuals it is equal to the body height. In a specimen from Murree, however, it is considerably longer than the depth of the body. The pectoral fins are low, considerably shorter than the head and sharp above. The pelvic fins do not reach the anal opening. The anal fin does not extend to the base of the caudal fin. The caudal fin is sharply divided, with the lower lobe somewhat more pointed' (Hora, 1939, p. 278).

*Scales.*—The skin of fishes is either covered with scales or naked. Some parts like the head and fins are more often naked than scaly. Scales of fishes are horny elements developed in grooves or pockets of the skin like hairs, nails or feathers of the higher vertebrates. Scales as those of carps, with an entire hind margin and a concentric striation are described as cycloid. The number of scales along the lateral line, as also the number of rows of scales above and below the lateral line, are often of specific significance.

*Lateral line* (L.1) is the line of perforated scales running along each flank of the fish. Beneath each pore is a group of sensory cells which perceive the slightest pressure changes in the surrounding water. The lateral line has nerves connected with the ear of the fish. The scale-counts in relation to the lateral line of *B. (Tor) putitora* are represented as follows:—L. 1. 25-28; L. tr.  $4\frac{1}{2}/2\frac{1}{2}$ . This signifies that there may be from 25 to 28 scales along the lateral line; L. tr. represents the number of transverse rows of scales between the middle line of the back and the ventral fin, and

in this case there are  $4\frac{1}{2}$  rows above (up to the base of the dorsal fin) and  $2\frac{1}{2}$  rows below (up to the base of the pelvic fin) the lateral line. The numbers of scales between certain other landmarks of the body also are sometimes taken into account. Thus in the Putitor Mahseer there are 9 scales before the dorsal fin (up to the head) and 12 round the caudal peduncle, and there is a well developed scaly appendage in the axil of the pelvic fin.

*Barbels.*—In some fishes as in carps skinny appendages called barbels or feelers occur on the jaws. According to their position they are described as *nasal* from the region of the nostril, *rostral* from the snout, *maxillary* from the upper jaw, usually at the corner of the mouth, *mandibular* associated with the lower jaw and *labial* associated with the lips. The Putitor Mahseer has two pairs of barbels, one rostral (*r. b.*) and the other maxillary (*m. b.*), which are more or less of equal length.

*Age.*—The condition of the scales and otoliths is said to indicate the age of a fish. Definite growth rings have been detected in the scales of European fishes like the salmon. But the technique is still undeveloped in the case of Indian Carps. To be able to say anything definite, it is desirable that large numbers of fish of different species in diverse waters be examined in detail and systematic observations made on their scales to elucidate the significance of the rings. The ear sacs containing the otoliths are situated on the sides of the base of the skull. The otolith is a bony concretion and increases in size during the entire life of the fish, each year adding two layers, a light one formed in summer and a dark one in autumn and winter. The number of pairs of layers represent the age of the fish. Here again, variations may occur, and the technique has yet to be perfected in the case of Indian fishes.

*Sex.*—Fleshy protuberances and hypertrophied lips (fig. 2a) have been suggested to have a sexual significance; but those characters are not reliable, and the crucial test is an examination of the gonads. But if it is difficult to be sure whether it is an ovary or a testis, the same may be preserved and sent, with other particulars, to the Bombay Natural History Society for further study.

The gonads occur as a pair of elongated, light-coloured, strap-shaped bodies lying one on each side of the intestines, and lodged in the groove between the air-bladder and the abdominal wall. Each gonad appears as a quill-like bag, which in the female shows little rounded dots of eggs which are absent in the male.

*Colour.*—There is a variety of colours among the different Mahseers, and even in the same species the colours vary considerably according to the nature of the waters inhabited by the fish. Here is Hora's description (1939, pp. 278, 279) of a nine-inch long specimen of *B. (Tor) putitora* freshly collected from the Tista river near Washabari Bazaar in the Eastern Duars:—

'The dorsal surface of the head and a small anterior portion of the body were found to be of a Lincoln green colour while the ground colour of the remaining portion of the dorsal surface of the body was warm buff which faded into light pink at the sides and silvery white on the ventral surface. On the sides, between the upper angles of the gill-openings and the base of the caudal fin, there were broad bands of light mineral gray. Each scale was

anteriorly marked with a gray blotch. The portion of the tail in front of the caudal fin was marked with an irregular, broad, vertical band of amber yellow. The operculum and the sides of the snout were of gray colour while patches of orange and yellow colour were present on other parts of the head. The dorsal fin was light yellow in colour while its rays were conspicuously yellowish gray. The fin was provided with a broad band of mineral gray across the rays. The pectoral fins were pink at their bases and citron yellow distally. The pelvic fins were yellowish with a tinge of pink at their bases and extremities. The anal fin was likewise citron yellow with pink extremity. The caudal fin was also citron yellow with its rays of mineral gray colour; it was edged with pink and gray.

He further describes a  $3\frac{1}{2}$  feet long specimen of the same species collected from another region of the Tista river and kept in a *kachha* tank at the Rungli Rungliot Tea Estate, Darjeeling District, as follows:—

'The back was reddish sap green and along the sides above the lateral line there was a broad band with a purplish shadow throughout. Below the lateral line the body was light orange which faded into silvery white on the belly. The head below the level of the eyes was light buff yellow which was replaced ventrally by a light neutral tint. The iris was light green while the pupil was dark blue. The scales in the upper half of the body were marked anteriorly by reddish sap green colour while in the centre they were brilliantly orange, their posterior edges were peacock green in colour with shades of light and deep sap green anteriorly. The pectoral, pelvic, anal and caudal fins were peacock green in colour; the distal tip of the anal was marked with a patch of reddish orange, while the posterior border of the caudal fin was marked with reddish green. The tubes on the lateral line were greenish silvery.'

The best way to paint or draw a Mahseer would be to keep by one's side three or four sketches of the Mahseer in outline, keep the fish alive in the water beside you, and as the colours of the fish are noted down, put it back for a breather. In this way the most accurate notes can be made. If you put him on the bank alive, he will start changing colour almost noticeably, and by the time you have worked back to your first notes, the colour will have changed.

The resplendent hues of living fish are inimitable; you can almost see the changing hues and sheen-like colouring fade with the life of the expiring fish.

Notes, even though rough, and the colours approximately close to those of the living fish, are always valuable. Time in carrying out this difficult task is never wasted. As per Formula below.

*Formula for Field Notes on Mahseer Catches.*

- I. Locality, date and time of catch with notes on the habitat.
- II. Colour notes with special reference to the colour of the back, sides, belly, tail, cheeks, fins.
- III. Body form and other general features, such as condition of lips, barbels, etc,

## IV. Body proportions and weight :

Total length, Length without tail fin, Length of head, Depth, Girth.

## V. Scale count :

Along lateral line, Above lateral line to beginning of dorsal fin, Below lateral line to beginning of pelvic fin.

## VI. Sex ; Condition of gonads : immature, fairly mature, full or spent.

## VII. Food :

Gut-contents, items and their approximate proportions, such as 'insects 60%, molluscs 25%, aquatic plants 10%, indistinguishable, digested matter 5%'.

## BIONOMICS.

*Food and feeding habits.*—The Mahseer is noted to be an intermittent feeder. Green filamentous algae and other water plants, slimy matter encrusting rocks, insect larvae, etc. have been recorded from the stomach-contents of the Putitor Mahseer. Thomas, discussing the food of the Mahseer, observes :—

'Aquatic weeds of all sorts, some taken intentionally, some when grabbing at the insects that live on them; seeds of the *Vateria indica* or Dhup of the West Coast, which are about the size of a pigeon's egg; the seeds of many other trees also which hang over the river where it is forest-clad; bamboo seeds; rice thrown in by man; and unhusked rice, or paddy as it is washed from the fields; crabs . . . , small fish, earthworms, water beetles, grasshoppers, small flies of sorts, water or stone crickets, shrimps, and molluscs or fresh-water snails are also found there, the latter shell and all, and smashed to pieces like the crabs.

'Of all this category the easiest food for the fisherman to present in a natural form is a small fish, or imitation fish.

'It will also be observed that the food taken on the surface of the water is little in comparison with that taken under it, and at the very bottom. The fish, beetles, crickets, shrimps are all found well under water; the crabs, worms, molluscs, quite at the bottom; and from the proportionate quantity found in them, the crabs, molluscs and fish seem to be their favourite food.

'This is what Paley would call "internal evidence". But we have also external evidence to the same effect . . . The four fine feelers hanging down, two on each side of the mouth, which give him the scientific name of *Barbus* or bearded (from the Latin *barba*, a beard), are indications of a bottom feeder.

'The upper lip is capable of being extended beyond the lower lip, and brought down to the same level, so as to form a cup on the bottom of the stream, and cover any small body, such for instance as the aforesaid molluscs detached from their hold by their upper lip, and being washed rolling down the bottom of the stream. The molluscs being thus detached and covered, are readily drawn up into the mouth by suction.' The suctorial mouth may also be used for adhesive purposes against the swift torrents.

Whereas in the younger stages Mahseers feed on algae, insects, small fish, etc., middle sized specimens and older ones prefer crabs, molluscs and other hard objects which can be easily tackled by the crushing and grinding pharyngeal teeth, often prized as trophies by the angler, especially as these provide fairly reliable evidence of the size of the specimen caught. These teeth are borne on the pharyngeal bone, which is the well developed fifth gill arch. As the pharyngeal teeth lie in the throat of the fish they are not used in catching or holding the prey, but are employed for tearing and masticating purposes. As the fish grows the teeth are shed individually as they become worn and replaced by fresh teeth that may be found growing in the adjoining mucous membrane.

Examination of the gut-contents of a large number of specimens will reveal the feeding habits of the fish in different waters. The digestive tract of the fish enlarges into an elongated thin-walled bag-like stomach which leads into a long narrow tubular intestine coiled into several loops and opening out at the anus. The liver and other digestive glands are associated with the tract. For purposes of food analysis the gut may be severed at the throat and at the anus, and after making a tiny incision on the stomach the whole, with the contents intact, may be preserved in 5% formalin and sent to the Society.

*Migration and spawning.*—During the floods the Mahseer ascends considerable heights to gain the upper reaches of the river travelling long distances for fresh feeding grounds and for the purpose of spawning. There they linger till the diminishing stream warns them to be moving downwards. There they lay their eggs in sheltered rock pools, not in the manner of the salmon, all at one time, but a batch of eggs at a time, repeating the process several times in a season. The Putitor Mahseer is said to spawn three times in the year. In the Punjab the three spawning seasons are (i) January and February, (ii) May and June (snow melts) and (iii) July to September (monsoon months).

*Other Himalayan Mahseers.*—The following key of Hora will be helpful to distinguish specimens over 9 inches of the various Mahseers of established status:

- I. Labial groove interrupted in the middle; lips comparatively thin and never hypertrophied; cheeks covered with tubercles.

*Barbus (Lissochilus) hexagonolepis* McClelland. The Katli of the Nepalese and Bokar of the Assamese. The Chocolate, Olive, Black or Red Mahseer of Burma.

- II. Labial groove continuous; lips thick and well formed, sometimes produced into adipose flaps; cheeks smooth.

- A. Length of head considerably greater than depth of body.

*Barbus (Tor) putitora* (Hamilton).

The Golden or the Common Himalayan Mahseer including Greyhound and Thick-lipped varieties.

- B. Length of the head considerably shorter than or more or less equal to depth of body.

1. Length of head considerably shorter than depth of body.  
*Barbus (Tor) tor* (Hamilton).  
The Deep-bodied Mahseer.
2. Length of head more or less equal to depth of body.  
*Barbus (Tor) mosal* (Hamilton).  
The Copper Mahseer.

*Size and distribution of the Mahseers.*—The Putitor Mahseer has been recorded by Hamilton to grow up to 9 feet. It occurs all along the Himalayas and probably extends to China. The Lissochilus Mahseer is said to grow over 2 feet in length (a 21 lb. *Katli* has been reported by Holt, 1940). It is the commonest large-scaled barbel of Assam and of the Eastern Himalayas. The Tor Mahseer grows to about 4 feet. It seems to be widely distributed along the foot hills of the Himalayas. It also occurs in the rivers of Assam and the Central Provinces. The Mosal Mahseer may attain a length of 5 feet and appears to be more common in Burma than in the Himalayan streams.

*The Black Mahseer.*—The Black Mahseer is a case of *melanism* or unusually dense pigmentation. It cannot be regarded as a distinct variety since melanic specimens belonging to different species have been described or figured as Black Mahseer. Several cases of melanism in diverse types of fishes are on record and it is believed to be due to genetic or pathogenical causes. How far environmental factors such as the influences of light, temperature, climate, food, etc. are responsible for melanism is yet to be determined.

To those interested in this subject, and who wish to study it further, I can do no better than introduce them to Shaw and Shebbeare's 'The Fishes of Northern Bengal' and Dr. Sunder Lal Hora's series of articles on 'The Game Fishes of India' appearing in *The Journal of the Bombay Natural History Society* (from Volume xxxix, part II of 15 April 1937 onwards). The first is already available in book form excellently arranged with drawings and photographs of most of the fishes to be found in India, with clear and simple notes, and is easy to follow. Dr. Hora needs no introduction. He is the leading authority on Fish in India, and his articles are of immense value to all lovers of the sport. I look forward to the day when this series will have been completed and published in book form—the fishes illustrated in colour—to take its place by those excellent volumes published by the Society, *The Game Birds of India* etc.

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#### EXPLANATION OF TEXT-FIGURES.

Figure 1. *Barbus (Tor) punitora* (Hamilton).

- (1) a-d. Length of Head. (contained 3 to 3.6 times in standard length. *ag*).
- (2) b-c. Diameter of eye. (contained 2.8 to 5.3 in length of head. *ad*).
- (3) a-g. Length of body. (standard length).
- (4) a-h. Total length of fish.
- (5) e. Anus.
- (6) a-b. Length of snout.
- (7) f-g. Caudal peduncle (the least height of caudal peduncle is contained from 1.4 to 1.8 times in its own length).
- (8) L. l. Lateral Line. (25 to 28 scales. 26 in Plate).
- (9) L. tr. Lateral traverse.  $4\frac{1}{2}/2\frac{1}{2}$ . This represents the number of transverse rows of scales between the middle line of the back and the ventral fin. Here there are  $4\frac{1}{2}$  rows above (up to the base of the dorsal fin) and  $2\frac{1}{2}$  rows below, (up to the base of the ventral or pelvic fin, counting in each case to the lateral line).
- (10) Barbels. m. b. maxillary (from the upper jaw).  
r. b. rostral (from the snout).
- (11) Paired Fins. P. Pectoral.  
V. Ventrals or Pelvics.  
Vertical Fins. D. Dorsal.  
C. Caudal or tail fin.  
A. Anal.
- (12) Fin Rays. (s) Simple or spine.  
(r) Soft or branched.
- (13) The depth of the body is the vertical distance between the dorsal and ventral surfaces at the deepest part.
- (14) The girth is the measure round the stoutest part.
- (15) Fin formula of Figure 1 D. 4/9. A. 8. P. 17-18. V. 10. C. 19.

#### Figure 2. Oral features of Mahseers.

(a) Side view of head and fore part of body of a true Mahseer of the *Tor* type, *Barbus (Tor) tor* (Hamilton), showing hypertrophied lips extended. For purposes of drawing, the lips were drawn out to their fullest extent. *In nature the enlarged lips, however, remain compressed and neatly folded, and conforming with the general contour of the head.*

(b) Ventral view of head and fore part of body of B. (*Tor*) *tor* (Hamilton) showing the continuous post-labial groove and the enlarging lips with the median lobe of the lower lip.

(c) Ventral view of head and fore part of body of a *Lissochilus*-type of Mahseer, *Barbus (Lissochilus) hexagonolepis* (McClelland). Note the interrupted post-labial groove and the normal lips.

p.l.g. = Post-labial groove.

#### EXPLANATION OF PRINCIPAL TERMS, ABBREVIATIONS, AND SIGNS USED IN THE DESCRIPTION OF FISH.

D=Dorsal (fin) 'fin' omitted when the meaning is clear.

P=Pectorals.

'Paired' fins.

V=Pelvis (or Ventrals).

A=Anal.

C=Caudal or tail fin.

The Adipose dorsal or Adipose fin has no rays. It is present in many of the Cat-fishes (also in trout and Salmon). Represented by (o) *Formulae for fins*. Figures refer to the number of rays. Two figures separated by a hyphen (-) denote the limits between which the number may vary.

An oblique stroke (/) separates two types of rays in one fin, such as undivided or entire from divided or branched rays.

A vertical stroke (|) separates different fins, such as the Dorsal from the Adipose dorsal on Cat-fishes, or the Spiny from the Articulated dorsal in Perches.

*The Lateral Line* (L. l) is a row of perforated scales running from the angle of the gill-opening to the base of the Caudal in most scaled fishes. It may be absent, incomplete or interrupted.

*Scales.* These are ordinarily counted along the lateral line, where there is one, the number being shown by a figure following the letters L.l. Where there is no lateral line they are counted along the lateral row of the scales where the lateral line would ordinarily be and shown after the letters L. r.

*Lateral traverse* (L.tr). Another count that is sometimes made is the number of transverse rows of scales between back and belly. It is counted from the base of the Dorsal to the lateral line and again from the lateral line to the point of insertion of the Pelvics. The number is shown after the letters L. tr.

*Barbels.* These are named after the part from which they spring :—

*Nasal* from the region of the nostrils.

*Rostral* from the snout.

*Moxillary* from the upper jaw.

*Mandibular* from the lower jaw.

(To be continued)